marconi instruments

BIN
19

SIGNAL GENERATORS

2018

80 kHz to 520 MHz

2019

80 kHz to 1040 MHz

Operating Manual

19

Signal Generators

2018 and 2019

(80 kHz - 520 MHz)
Code No. 52018-900F

(80 kHz - 1040 MHz)
Code No. 52019-900C

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MARCONI INSTRUMENTS LIMITED
ST. ALBANS HERTFORDSHIRE ENGLAND

CONTENTS

PRELIMINARIES

Title page
Contents
Notes and cautions

CHAPTERS

1 General information
2 Installation
3 Operation
4 Technical description
5 Maintenance
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These chapters are contained in a separate volume available as an optional extra.

HAZARD WARNING SYMBOLS

The following symbols appear on the equipment.

Symbol	*Type of hazard*	*Reference in manual*
	Static sensitive device	Page (iv)
	Component containing beryllia	Page (iv)

Note...

Each page bears the date of the original issue or the code number and date of the latest amendment (Am.1, Am.2 etc.). New or amended material of technical importance introduced by the latest amendment is indicated by triangles positioned thus ▶.....◀ to show the extent of the change. When a chapter is reissued the triangles do not appear.

Any changes subsequent to the latest amendment state of the manual are included on inserted sheets coded C1, C2 etc.

NOTES AND CAUTIONS

ELECTRICAL SAFETY PRECAUTIONS

This equipment is protected in accordance with IEC Safety Class 1. It has been designed and tested according to IEC Publication 348, 'Safety Requirements for Electronic Measuring Apparatus', and has been supplied in a safe condition. The following precautions must be observed by the user to ensure safe operation and to retain the equipment in a safe condition.

Defects and abnormal stresses

Whenever it is likely that protection has been impaired, for example as a result of damage caused by severe conditions of transport or storage, the equipment shall be made inoperative and be secured against any unintended operation.

Removal of covers

Removal of the covers is likely to expose live parts although reasonable precautions have been taken in the design of the equipment to shield such parts. The equipment shall be disconnected from the supply before carrying out any adjustment, replacement or maintenance and repair during which the equipment shall be opened. If any adjustment, maintenance or repair under voltage is inevitable it shall only be carried out by a skilled person who is aware of the hazard involved.

Note that capacitors inside the equipment may still be charged when the equipment has been disconnected from the supply. Before carrying out any work inside the equipment, capacitors connected to high voltage points should be discharged; to discharge mains filter capacitors, if fitted, short together the L (live) and N (neutral) pins of the mains plug.

Mains plug

The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension lead without protective conductor. Any interruption of the protective conductor inside or outside the equipment is likely to make the equipment dangerous.

Fuses

Note that there is a supply fuse in both the live and neutral wires of the supply lead. If only one of these fuses should rupture, certain parts of the equipment could remain at supply potential.

To provide protection against breakdown of the supply lead, its connectors, and filter where fitted, an external supply fuse (e.g. fitted in the connecting plug) should be used in the live lead. The fuse should have a continuous rating not exceeding 6 A.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of mended fuses and the short-circuiting of fuse holders shall be avoided.

RADIO FREQUENCY INTERFERENCE

This equipment conforms with the requirements of IEC Directive 76/889 as to limits of r.f. interference.

CAUTION : STATIC SENSITIVE COMPONENTS

Components identified with the symbol on the circuit diagrams and/or parts lists are static sensitive devices. The presence of such devices is also indicated in the equipment by orange discs, flags or labels bearing the same symbol. Certain handling precautions must be observed to prevent these components being permanently damaged by static charges or fast surges.

(1) If a printed board containing static sensitive components (as indicated by a warning disc or flag) is removed, it must be temporarily stored in a conductive plastic bag.

(2) If a static sensitive component is to be removed or replaced the following anti-static equipment must be used.

A work bench with an earthed conductive surface.

Metallic tools earthed either permanently or by repeated discharges.

A low-voltage earthed soldering iron.

An earthed wrist strap and a conductive earthed seat cover for the operator, whose outer clothing must not be of man-made fibre.

(3) As a general precaution, avoid touching the leads of a static sensitive component. When handling a new one, leave it in its conducting mount until it is required for use.

WARNING : HANDLING HAZARDS

This equipment is formed from metal pressings and although every endeavour has been made to remove sharp points and edges care should be taken, particularly when servicing the equipment, to avoid minor cuts.

WARNING : TOXIC HAZARD

Many of the electronic components used in this equipment employ resins and other chemicals which give off toxic fumes on incineration. Appropriate precautions should therefore be taken in the disposal of these items.

Beryllia (beryllium oxide) is used in the construction of the following components in this equipment :

Unit AC4 : Transistor TR10
.....

This material, when in the form of fine dust or vapour and inhaled into the lungs, can cause a respiratory disease. In its solid form, as used here, it can be handled quite safely although it is prudent to avoid handling conditions which promote dust formation by surface abrasion.

Because of this hazard you are advised to be very careful in removing and disposing of these components. Do not put them in the general industrial or domestic waste or despatch them by post. They must be separately and securely packed and clearly identified to show the nature of the hazard and then disposed of in a safe manner by an authorized toxic waste contractor.

Chapter 1

GENERAL INFORMATION

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FEATURES

1. 2018 and 2019 are stable, a.m./f.m. synthesized signal generators. 2018 covers the frequency range 80 kHz to 520 MHz. 2019 includes a frequency doubler which increases the frequency range to 1040 MHz. Both are phase locked to a frequency standard and can be set to a resolution of 10 Hz at frequencies up to 520 MHz, and in the case of 2019 a resolution of 20 Hz for frequencies above 520 MHz.

Fig. 1 80 kHz to 1040 MHz AM/FM Synthesized Signal Generator 2019

2. Front panel operation is carried out by direct entry of required settings via the keyboard. Microprocessor control ensures maximum flexibility and allows programming by the General Purpose Interface Bus (GPIB).* This facility is offered as an optional accessory enabling the instrument to be used both as a manually operated bench mounted instrument or as part of a fully automated test system. Provision is also made for the use of an external standard frequency reference when this is preferred.

Output

3. Calibrated output levels from -127 dBm to +13 dBm (0.2 μV to 2 V e.m.f.) in the c.w. and f.m. modes and up to +7 dBm (1 V e.m.f.) in the a.m. mode are provided. A choice of nine output level calibration units can be obtained on the front panel. The r.f. output level can be set to a resolution of 0.1 dB or better over the entire output voltage range and features a total cumulative accuracy of ±1 dB up to 520 MHz (±2 dB, 520 MHz - 1040 MHz). Protection against the accidental application of up to 50 W of reverse power is provided by a fast responding reed relay.

Modulation

4. Amplitude and frequency modulation can be carried out from either external or internal modulation sources. The internal modulation source provides five fixed modulation frequencies suitable for most normal applications. If required, alternative frequencies can easily be set by re-selecting components within the instrument. Details of this are given in the Service Manual.

GPIB - Marconi Instruments General Purpose Interface Bus in accordance with IEEE Standard 488 - 1978 and IEC Publication 625-1.

Front panel

5. The instrument settings are displayed by three liquid crystal displays that include annunciators to show the units of the displayed data. All data is entered on a keyboard that has been designed to be simple and logical to use. Non-volatile store and recall facilities are also provided by using an electrically alterable read only memory (EAROM) store that does not require a battery back-up system. Carrier frequency, f.m., a.m., and r.f. level functions may be incremented or decremented using the up/down keys.

6. Second function mode of operation. This includes the means of setting the GPIB address, selection of alternative r.f. level calibration units, access to various calibration routines and a facility to aid diagnostic fault finding.

PERFORMANCE DATA

7. The performance specifications for 2018 and 2019 are in most respects identical, therefore the following data applies to both versions of the instrument except where otherwise stated.

Characteristic	*Performance*	
	2018 version	*2019 version*
Carrier frequency		
8. Range :	80 kHz-520 MHz (usable down to 30 kHz).	80 kHz-1040 MHz (usable down to 30 kHz.
Resolution :	10 Hz	10 Hz up to 520 MHz. 20 Hz above 520 MHz.
VSWR :	<1.2:1 (for output levels below 300 mV e.m.f.)	<1.2:1, up to 520 MHz, <1.5:1, 520 MHz to 1040 MHz (for output levels below 300 mV e.m.f.).
Output level accuracy :	±1 dB.	±1 dB from 80 kHz to 520 MHz, ±2 dB from 520 MHz to 1040 MHz.
Harmonically related signals : (for output levels <1 V e.m.f.)	-30 dBc for carrier frequencies from 80 kHz to 520 MHz.	-30 dBc for carrier frequencies from 80 kHz to 520 MHz. -20 dBc for carrier frequencies from 520 MHz to 1040 MHz.

Characteristic	*Performance*	
	2018 version	*2019 version*
Frequency modulation		
9. Range	(i) Peak deviation from 10 Hz to up to 1% of carrier frequency for carrier frequencies above 2.03126 MHz.	(i) Peak deviation from 10 Hz to up to 1% of carrier frequency for carrier frequencies from 2.03126 MHz to 520 MHz.
	(ii) Peak deviation from 10 Hz to 100 kHz for carrier frequencies ≤2.03125 MHz.	(ii) Peak deviation from 10 Hz to 100 kHz for carrier frequencies ≤2.03125 MHz.
		(iii) Peak deviation from 20 Hz to up to 1% of carrier frequency for carrier frequencies above 520 MHz.

10. The remaining characteristics are common to both 2018 and 2019.

Characteristic	*Performance*
Carrier frequency	
11. Selection :	By keyboard entry.
Frequency indication :	8 digit l.c.d. - for details see under Keyboard and displays.
Accuracy :	Equal to the frequency standard accuracy - see under Frequency standard.
RF output	
12. Level :	0.2 µV to 2 V e.m.f.; c.w. and f.m. 0.2 µV to 1 V e.m.f.; when a.m. is selected.
Selection :	By keyboard entry - units may be (i) µV, mV, V, e.m.f. or p.d. or (ii) dB relative to 1 µV, 1 mV, 1 V, e.m.f. or p.d. or (iii) dBm.
Display :	4 digit l.c.d. with units annunciators - see under Keyboard and displays.
Output impedance :	50 Ω, Type N female socket.
Reverse power protection :	An electronic trip protects the generator output against reverse power of up to 50 W from d.c. to 1 GHz. The trip may be reset from the front panel or via the GPIB.

Characteristic	*Performance*
Spurious signals	
13. Non-harmonically related signals :	-70 dBc above 2.03126 MHz, -60 dBc from 80 kHz to 2.03125 MHz.
Residual f.m. :	Less than 6 Hz r.m.s. in CCITT telephone psophometric band at 520 MHz and improving by approximately 6 dB/octave with reducing carrier frequency down to 2.5 MHz.
Single side band phase noise :	Better than -130 dBc/Hz at 90 MHz and 20 kHz offset from carrier.
RF leakage :	Less than 0.5 µV p.d. generated in a 50 Ω load by a 2 turn 25 mm loop, 25 mm or more from the case of the generator with the output level set to less than -10 dBm and the output terminated in a 50 Ω sealed load.
Frequency modulation	
14. Selection :	Internal modulation oscillator or external modulation input may be selected by the front panel keyboard.
Display :	3 digit l.c.d. - see under Keyboard and displays.
Deviation accuracy :	±5% of deviation at 1 kHz modulating frequency excluding residual f.m.
Frequency response :	±1 dB from 50 Hz to 100 kHz relative to 1 kHz. Usable down to 10 Hz with reduced deviation.
Distortion :	<3% total harmonic distortion at 1 kHz modulating frequency and a deviation of up to 70% of the maximum available at any carrier frequency. <0.3% total harmonic distortion at 75 kHz deviation at carrier frequencies from 88 MHz to 108 MHz at 1 kHz modulating frequency.
External modulation :	With modulation a.l.c. on, the deviation is calibrated for input levels between 0.8 V and 1.2 V p.d. With modulation a.l.c. off, the deviation is calibrated for an input level of 1 V p.d. Input impedance is nominally 100 kΩ.

Characteristic	*Performance*
Amplitude modulation	
15. Range :	0 to 99% in 1% steps.
Selection :	Internal modulation oscillator or external modulation input may be selected by the front panel keyboard.
Display :	2 digit (see under Keyboard and displays).
Accuracy :	Better than ±(4% of depth setting + 1%) for modulation depths up to 95% and 1 kHz modulating frequency for carrier frequencies up to 400 MHz.
Frequency response :	±1 dB from 20 Hz to 50 kHz relative to 1 kHz at 80% depth d.c. coupled.
Envelope distortion :	Less than 3% total harmonic distortion for modulation depths up to 80% at 1 kHz modulating frequency for carrier frequencies up to 400 MHz. Less than 2% total harmonic distortion for modulation depths up to 90% at 1 kHz modulating frequency for carrier frequencies up to 32 MHz.
External modulation input :	With the modulation a.l.c. on, the modulation depth is calibrated for input levels between 0.8 V and 1.2 V p.d. With the modulation a.l.c. off, the modulation depth is calibrated for an input level of 1 V p.d. Input impedance is nominally 100 kΩ, d.c. coupled.
Modulation oscillator	
16. Frequencies :	300 Hz, 400 Hz, 1 kHz, 3 kHz and 6 kHz selected sequentially by repetitive pressing of modulation oscillator key.
Display :	Five l.e.d's indicate selected frequency.
Frequency accuracy :	±5%.

Characteristic	*Performance*
Frequency standard	
17.	Internal or external frequency standard may be selected from the front panel. Annunciators show which is selected.
Internal standard :	High stability, oven controlled 10 MHz crystal oscillator.
Temperature stability :	<±0.1 p.p.m. over temperature range of 0 - 40°C.
Warm up time :	Within 0.5 p.p.m. of final frequency within 5 minutes from switch on at ambient 20°C.
Auxiliary inputs and outputs	
18. Modulation input/output :	A front panel BNC socket provides an output from the modulation oscillator when internal modulation is selected and becomes the external modulation input when external modulation is selected.
Internal modulation oscillator output :	Nominal 1 V e.m.f. sine wave from 1 kΩ source impedance at selected modulation frequency.
External modulation input :	Input level nominally 1 V into 100 kΩ - see under Frequency modulation and Amplitude modulation.
Frequency standard input/output :	A rear panel BNC socket provides an output from the internal frequency standard when internal standard is selected and becomes the external standard input when external standard is selected.
Internal standard output :	10 MHz, at nominally 3 V p-p square wave. Source impedance 100 Ω nominal.
External standard input :	Accepts a 10 MHz signal of at least 1 V r.m.s. Maximum input 2.5 V r.m.s.
Alternative outputs :	Blanked holes are provided so that the user can fit the r.f. output, and modulation input/output socket to the rear panel for systems use etc.

Characteristic	*Performance*

Keyboard and displays

19. Main and secondary keyboard functions : These are described in Chap. 3, Operation. All instrument settings are controlled by the front panel keyboard.

Displays : Three liquid crystal displays provide simultaneous readout of carrier frequency, modulation and r.f. level.

(i) Carrier frequency display - 8 digit with annunciators to show frequency units, external frequency standard, frequency limit exceeded, remote operation selected and instrument addressed.

(ii) Modulation display - 3 digit with annunciators to show modulation units, f.m., a.m., modulation off, external modulation selected, and modulation limit exceeded.

(iii) RF level display - 4 digit with annunciators to show r.f. level units, r.f. output off, reverse power trip operated, and r.f. level limit exceeded.

GPIB interface

20. A GPIB interface is available as an optional accessory and can be easily fitted by the user. All functions except the SUPPLY ON switch are remotely programmable.

Capabilities : Complies with the following subsets as defined in IEEE 488 - 1978 and IEC Publication 625-1 : SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C0, E1.

Environmental

21. Conditions of storage and transport

Temperature : $-40^{o}C$ to $+70^{o}C$.

Humidity : Up to 90% relative humidity.

Altitude : Up to 2500 m (pressurized freight at 27 kPa differential i.e. 3.9 lbf/in^2).

Rated range of use temperature : 0 to $55^{o}C$.

Characteristic	*Performance*
Safety	
22.	Complies with Publication IEC 348.
Radio frequency interference	
23.	Conforms to the requirements of EEC Directive 76/889 as to limits of r.f. interference.
Power requirements	
24. Voltage :	AC supply. Voltage ranges (switchable)
	105 V - 120 V } ±10% 210 V - 240 V }
Frequency :	45 Hz - 440 Hz.
Consumption :	70 VA max.
Weight and dimensions (over projections)	
25. Height :	152 mm (6 in).
Width :	425 mm (16 3/4 in).
Depth :	525 mm (20 3/4 in).
Weight :	16 kg (35 lb).

ACCESSORIES

Supplied accessories

	Code no.
26. AC supply lead	43123-076Y
Operating manual H 52018-900S (Vol. 1)	46881-419G

Optional accessories

27. Service manual H 52018-900S (Vol. 2)	46881-420J
GPIB module	54433-001U
Maintenance kit, includes r.f. extender cables, l.c.d. insertion and extraction tools etc.	54711-033E
Rack mounting kit	46883-506M
Front handle kit	46883-511R
GPIB manual H 54811-010P	46881-365R
GPIB lead assy.	43129-189U
GPIB IEEE/IEC connector adaptor	46883-408K
RF connecting cable TM 4969/3; 50 Ω, 1.5 m (5 ft) BNC	43126-012S
Impedance adaptor 50/75 Ω	54411-051X
Adaptor; type N male to BNC female	54311-092P

Chapter 2

INSTALLATION

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1 Unpacking and repacking
3 Mounting arrangements
4 Connecting to supply
6 Safety testing
7 GPIB interface
8 Rack mounting
9 Front panel handles

Fig. Page
1 Voltage ranges 2

UNPACKING AND REPACKING

1. Retain the container, packing material and the packing instruction note (if included) in case it is necessary to reship the instrument.

2. If the instrument is to be returned for servicing attach a label indicating the service required, type or model number (on rear label), serial number and your return address. Pack the instrument in accordance with the general instructions below or with the more detailed information in the pack; ing instruction note.

(1) Place mains lead in suitable plastic bag and tape it to the instrument rear panel.

(2) Place the instrument within its plastic cover.

(3) Ensure that the padded fitting is in place within the inner carton and slide the instrument in, rear panel first, leaving the front panel exposed at the open end.

(4) Fit the separate front panel protecting cover over the panel and close and seal the inner carton.

(5) Place one of the moulded plastic cushions in the bottom of the outer carton and insert the inner carton to locate in the cushion recess.

(6) Place the other plastic cushion over the other end of the inner carton and close and seal the outer carton.

(7) Wrap the container in waterproof paper and secure with adhesive tape.

(8) Mark the package FRAGILE to encourage careful handling.

Note...

If the original container or materials are not available, use a strong double-wall carton packed with a 7 to 10 cm layer of shock absorbing material around all sides of the instrument to hold it firmly. Protect the front panel controls with a plywood or cardboard load spreader; if the rear panel has guard plates or other projections a rear load spreader is also advisable.

MOUNTING ARRANGEMENTS

3. Excessive temperatures may affect the instrument's performance; therefore, completely remove the plastic cover, if one is supplied over the case, and avoid standing the instrument on or close to other equipment that is hot.

CONNECTING TO SUPPLY

4. Before connecting the instrument to the a.c. supply check the position of the two voltage selector switches on the rear panel. A locking plate fixes both switches into one of four possible combinations and only the selected voltage range is displayed when the locking plate is fixed to the back panel. The instrument is normally despatched with the switches selected to 230/240 V. To select a different voltage range remove the locking plate and re-position the switches to the required range as shown in Fig. 1 below and refit the locking plate into its alternative position.

Note...

The a.c. supply fuse may also have to be changed. An indication of the correct fuse rating is given with each displayed voltage range:-

i.e. 1 A-T (1 amp time lag) 105 V - 120 V ±10%
0.5 A-T (0.5 amp time lag) 210 V - 240 V ±10%

The fuses are 20 mm x 5 mm cartridge type.

5. The free a.c. supply cable is fitted at one end with a female plug which mates with the a.c. connector at the rear of the instrument. When fitting a supply plug ensure that conductors are connected as follows:

Earth	-	Green/yellow
Neutral	-	Blue
Live	-	Brown

When attaching the mains lead to a non-soldered plug it is recommended that the tinned ends of the lead are first cut off owing to the danger of cold flow resulting in intermittent connections.

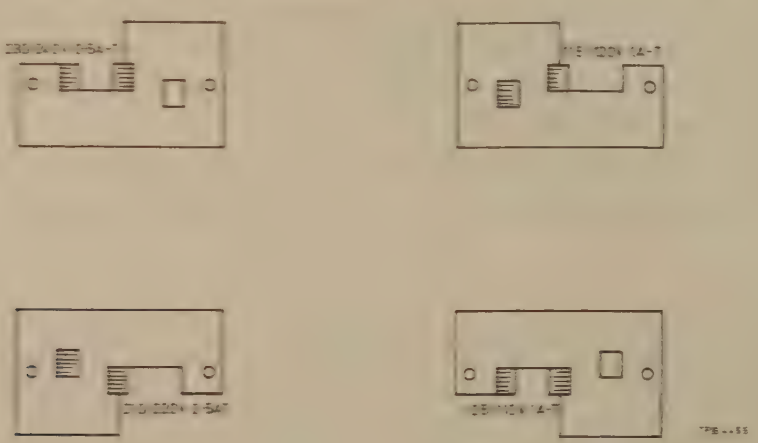

Fig. 1 Voltage ranges (alternative switch and locking plate positions)

SAFETY TESTING

6. Where safety tests on the a.c. supply input circuit are required, the following procedures can be applied. These comply with BS 4743 and IEC Publication 348. Tests are to be carried out as follows and in the order given, under ambient conditions, to ensure that a.c. supply input circuit components and wiring (including earthing) are safe.

(1) Earth lead continuity test from any part of the metal frame to the bared end of the flexible lead for the earth pin of the user's a.c. supply plug. Preferably a heavy current (about 25 A) should be applied for not more than 5 seconds.

Test limit : not greater than 0.5 Ω.

(2) 500 V d.c. insulation test from the a.c. supply circuit to earth.

Test limit : not less than 2 MΩ.

GPIB INTERFACE

7. The GPIB interface is an optional accessory and can easily be fitted by the user as follows:-

(1) Remove and discard the rectangular cover plate from the left-hand side of the rear panel.

(2) Withdraw the interconnecting lead from inside the instrument and connect this to the GPIB assembly.

(3) Using the four retaining screws provided, secure the GPIB assembly to the rear panel where four pre-positioned captive nuts are fitted. The interface is now ready for GPIB operation.

RACK MOUNTING

8. The instrument may be mounted in a standard 19 inch rack using the kit 46883-506M available as an optional accessory. Fitting instructions are as follows:-

(1) Remove both top and bottom outer covers, detach and discard front and rear feet on bottom cover.

(2) Detach and discard side trim infills, countersunk screws and screw cups.

(3) If it is desired to have the r.f. output and modulation input/output sockets on the rear panel complete steps 4 to 10. If rear panel connections are not required proceed to step 11.

(4) Remove the front panel assembly by slackening the two screws exposed in each side and lay face down protecting the l.c.d's.

(5) Disconnect the semi-rigid coaxial plug PLAV situated at the rear of the top r.f. box and remove the four r.f. box securing screws (one in each corner bracket); raise the box into the servicing position.

(6) Disconnect the Mod input/output connector from PLAF on AD2 motherboard. Remove the cable from the bottom r.f. box detaching the earth tag secured adjacent to the Mod. socket and disconnect the MOD INPUT/OUTPUT socket from the front panel assembly.

(7) Remove the blind grommet from the alternative rear panel position and refit the Mod input/output connector and socket to the rear panel, securing the earth tag to the stud adjacent to the socket. Fit the blind grommet into the front panel position, recleat the cable to the bottom r.f. box and reconnect PLAF to AD2 motherboard.

(8) Disconnect the r.f. output connector from SKBA on AT0 attenuator, and also the RF OUTPUT socket from the front panel assembly. Withdraw the connector and socket through the front panel. Remove the blind grommet from the rear panel alternative position and fit this to the front panel position.

(9) Pass the r.f. output connector through the alternative rear panel position and secure the RF OUTPUT socket to the rear panel. Re-route the cable over the bottom r.f. box and reconnect SKBA to AT0 attenuator.

(10) Lower the top r.f. box and secure this, reconnect PLAV to the rear of the box. Replace and secure the front panel assembly and side trim, also refit front handles if previously fitted.

(11) Fit rack brackets in front panel handles or side trim recesses using M4 x 16 pan head screws and washers, finally refit top and bottom covers.

FRONT PANEL HANDLES

9. Front handles are supplied only as optional accessories, fitting instructions are as follows:-

(1) Remove the side trim infills and side trims. Discard the side trims but retain the screws and washers for re-use. Position the instrument on its side.

(2) Fit the panel handles without the side trim infills first, aligning all four screws. Tighten down the two inner screws and washers and remove the two outer screws.

(3) Refit the side trim infills, replace the outer two screws and washers and tighten down.

Chapter 3

OPERATION

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PRINCIPLES OF CONTROL

1. All operations of the generator are carried out from the front panel keyboard which is divided into five distinct areas. Remote operation via a GPIB controller is possible if the optional GPIB interface is fitted. If an illegal operating condition is selected, either by local or remote control, this is indicated by a limit annunciator on the front panel display.

Front panel control

2. (1) SUPPLY switch. Applies the a.c. supply voltage.

(2) MOD OSC/ALC. The two black keys control the internal modulation frequency and the modulation automatic level control. The ALC key has an integral l.e.d. to indicate that selection has been made.

(3) MOD INPUT/OUTPUT socket. Provides a 600 Ω, nominal 1 V e.m.f. output from the internal modulation oscillator or accepts a 0.8 V - 1.2 V input from an external source.

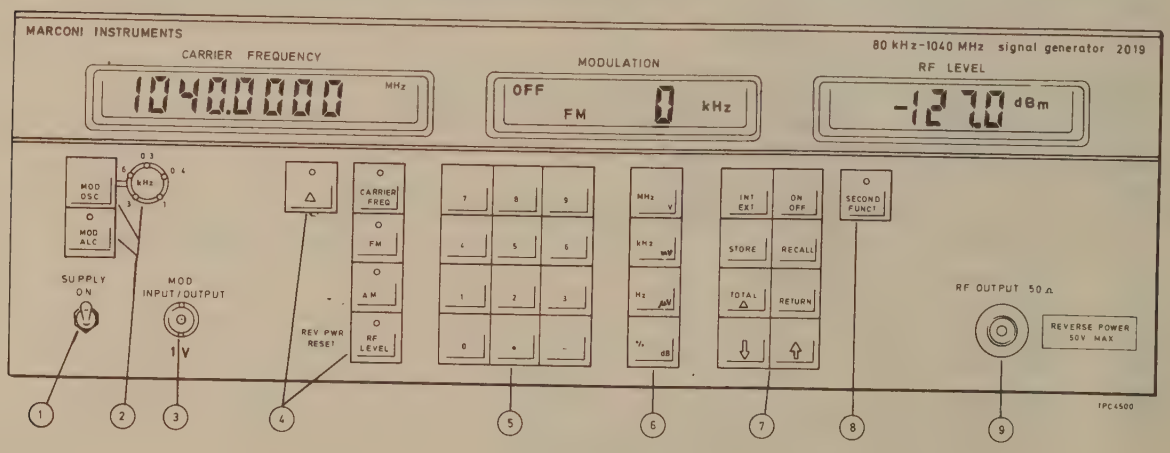


Fig. 1 Front panel controls

(4) Function keys. The five orange keys each have an integral l.e.d. to indicate the function currently selected.

(5) Numerical keypad. Enters the required value for the function currently selected, includes a minus sign and a decimal point.

(6) Units. The four grey keys are used to terminate the numerical entry.

(7) Miscellaneous functions. This right-hand group of eight black keys is concerned with such operations as STORE and RECALL, DECREMENT (⇩ down), INCREMENT (⇧ up) and TOTAL Δ.

(8) SECOND FUNCTION. This blue key with an integral l.e.d. is used to provide further less commonly used facilities.

(9) RF OUTPUT : 50 Ω N type output socket. Indication of the r.f. level is shown on the RF LEVEL display.

Rear panel control

3. (1) REMOTE CONTROL GPIB INTERFACE. This optional accessory allows remote control of the instrument. Accepts the 24 way IEEE GPIB connector.

(2) MOD IN-OUT/RF OUT, these blanked holes provide alternative fittings when the instrument is rack mounted. Fitting instructions are included in Chap. 2.

PULSE MOD IN, this blanked hole is used only if the pulse modulator option 52018-308N or 52019-308P is fitted.

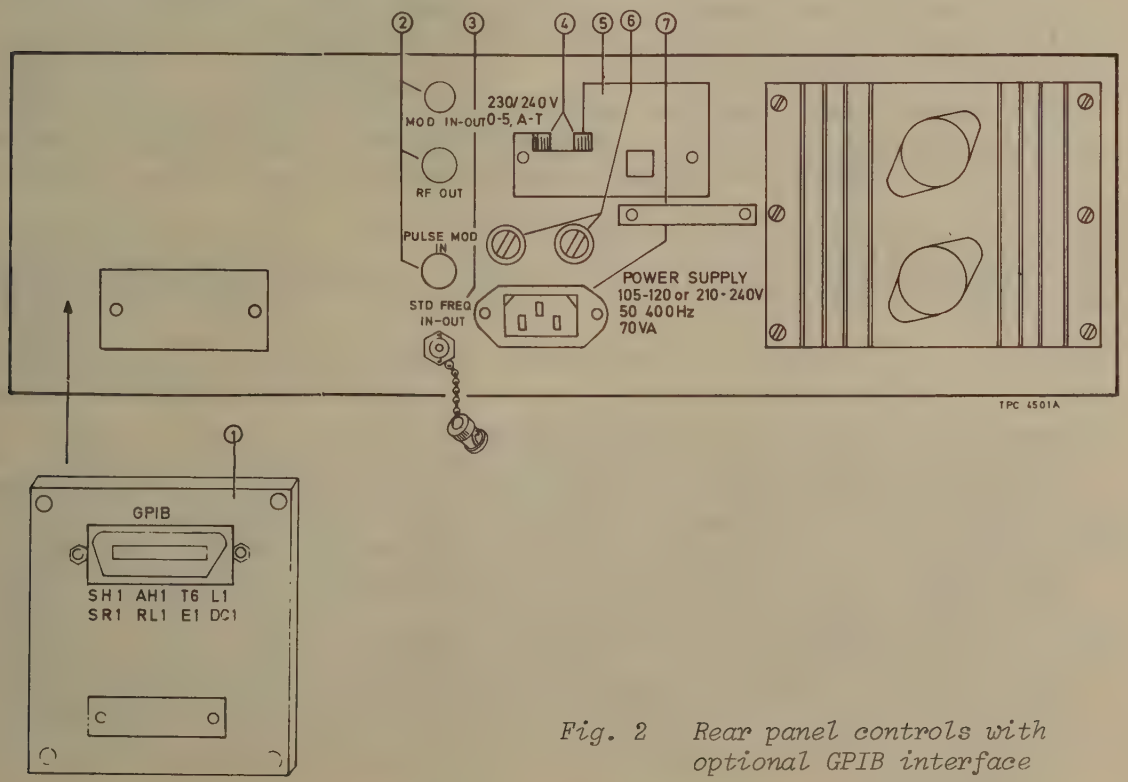


Fig. 2 Rear panel controls with optional GPIB interface

(3) STD FREQ IN-OUT. BNC socket provides an output from the internal 10 MHz reference standard or allows an input from an external 10 MHz reference depending on the function selected by the front panel keys.

(4) VOLTAGE SELECTOR switches, selects in a combination of four positions 105-110 V/115-120 V, or 210-220 V/230-240 V, each has a 10% tolerance to afford a complete cover over the voltage ranges 95 V-132 V and 190 V-264 V respectively.

(5) Selector switch plate. Secures the VOLTAGE SELECTOR switches into one of four pre-selected positions by either turning or reversing the plate before re-affixing to the rear panel.

(6) AC fuses. Supply input fuses are rated at 0.5 amp (slow-blow) for 190 V-264 V range or 1 amp (slow-blow) for the 95 V-132 V range.

(7) AC supply input. The a.c. supply is connected through this plug which mates with the connector fitted to the supply lead.

PREPARATION FOR USE

Switching on

4. With the instrument connected to a suitable a.c. supply proceed as follows:-

(1) Switch SUPPLY ON and check that the instrument has taken up the correct initial operating mode, that is CARRIER FREQ 520 MHz (1040 MHz for 2019) internal MOD OSC 1 kHz, no FM or AM MODULATION and minimum RF LEVEL (-127 dBm or equivalent). The instrument may be set to the contents of store 10 if second function '-' is in use. For details see the paragraph, Recall STORE 10 at switch on.

(2) Check that the carrier frequency window does not indicate EXT STD, unless an external frequency standard is being used. If this has been inadvertently selected press CARRIER FREQ and INT/EXT keys to reselect internal frequency standard.

(3) During normal operation the instrument's internal reference standard will give an accuracy within the rated performance after a warm-up period of about 5 minutes at normal room temperatures.

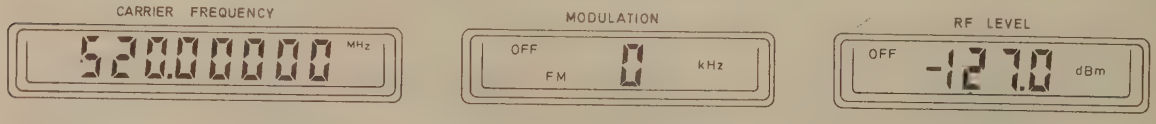


Fig. 3 2018 initial operating mode

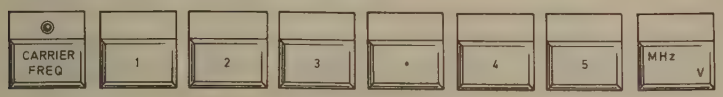
IPC4499

(4) Before the initial operating mode is indicated on the display an indication of the software program mod state is shown in the carrier frequency window i.e. 01,02,03 for approximately one second. If a fault condition exists in either the RAM or the PROM a letter H or P will be displayed in the modulation window and until the fault is rectified the instrument will be unable to take up the initial operating mode. A check sum is also carried out on the EAROM store. If this is in error a letter L will be displayed in the modulation window and the software program mod state i.e. 5 is shown in the carrier frequency window. The instrument may be reset to the initial operating mode by pressing any key on the front panel keyboard. In this fault condition only the RF level or FM tracking preset data is affected, details of which are given in the Service Manual.

OPERATING PROCEDURES

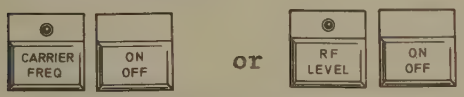
5. Selection of data is carried out by first pressing the required function key and this is then indicated by an integral l.e.d. Follow this with the numerals including a decimal point or negative sign if required, a positive sign is otherwise implied. If an error is made in the entry re-selection of the function key will clear the previous entry. Complete the entry by pressing the appropriate UNITS terminator key. If a request outside the operating range of the instrument is made a LIMIT annunciator will be set on the relevant display and the generator will tune to either the minimum or the maximum value nearest to the initial request. One exception to this is if a carrier frequency less than 80 kHz is selected, for details see next para.

Setting a carrier frequency



6. If the l.e.d. in the orange CARRIER FREQ key is off press the CARRIER FREQ key. If the l.e.d. is on this will not be necessary. Enter the required value via the numerical key pad including the decimal point if required, the data entered will appear in the carrier frequency display. Terminate the instruction by pressing the appropriate UNITS terminator key. If a request lower than the minimum specified frequency 80 kHz is made, the LIMIT annunciator is displayed and the instrument tunes to the requested frequency but with a degraded performance. When selections below 30 kHz are made the accuracy of the r.f. level output will be impaired.

Carrier on/off



7. The carrier may be switched on or off if either the CARRIER FREQ or the RF LEVEL function key is pressed followed by the ON/OFF key.

Incrementing and decrementing

8. To display current increment values press the orange key identified by a delta sign Δ. Initially the instrument will automatically select and display an increment for each of the main functions as follows:- Carrier frequency 1.00 kHz, Modulation, either FM 1 kHz, or AM 1%, and RF level 1.0 dB. To return the instrument to normal operation without affecting any current increment value that may have been selected press any function key twice. To enter a new value of increment such as a carrier frequency step of 10 kHz, press the keys shown in the example above. FM, AM or RF LEVEL may be similarly incremented, note that if incrementing the RF LEVEL the only valid terminator is the dB key.

(1) Each press of the

(up) key will then increment the carrier frequency by 10 kHz, likewise pressing the

(down) key will decrement the carrier frequency by a similar amount.

(2) Holding the UP or DOWN key pressed will result in continuous incrementing or decrementing after a delay of one second.

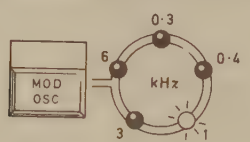
(3) Changing from the incrementing mode to the decrementing mode without the one second delay can be achieved by keeping the UP key continuously pressed allowing the instrument to increment, then following this selection press the DOWN key also. When the UP key is released the instrument will immediately decrement. A reversal from down to up without delay can then be achieved by pressing the UP key before releasing the DOWN key, and when the DOWN key is released the instrument will then immediately increment.

(4) To find the total shift from the original setting press the

(total) shift key. While this key is pressed all the displays will show the total shift of each function from their starting values. To return to the initial value of the selected function press the

key.

Internal modulation source



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9. The internal modulation oscillator frequency can be controlled by successive presses of the MOD OSC key. The circle of l.e.d's adjacent to the MOD OSC key will indicate the current modulation oscillator frequency. The modulation ALC is always on in the internal modulation mode.

External modulation

10. Press the FM or AM function key as appropriate followed by the INT/EXT key to select external, this is indicated on the modulation display by an EXT annunciator. Further pressing the INT/EXT key will return the instrument to the internal mode.

(1) If external modulation has been selected the signal from the externally applied modulation source can be set internally to the correct level (provided the applied voltage is between 0.8 V and 1.2 V) by pressing the

key. Selection is indicated by the integral l.e.d.

The instrument will normally power up with MOD ALC off when in the external modulation mode.

Setting f.m.

11. Select one of the five modulation frequencies 300 Hz, 400 Hz, 1 kHz, 3 kHz or 6 kHz as required by successive presses of the MOD OSC key. Continue the selection shown above to select a deviation of 20 kHz. The instrument normally switches on in the Internal mode. To select external f.m. first press the

key if its 1.e.d. is not on. Then press the

key. The f.m. will then be selected to external, and the EXT annunciator will set in the modulation display window. Pressing the INT/EXT key again will return the f.m. to the internal mode.

(1) To turn f.m. off whilst still retaining the current value of entered deviation, first press the

key if its 1.e.d. is not on followed by the

key. The off condition is indicated by the setting of an OFF annunciator in the modulation display window. Entering a new value of f.m. deviation will automatically select the f.m. on again.

(2) If the 2018 is to be utilized for signal-to-noise measurements within a narrow bandwidth a useful reduction of residual noise level may be obtained from the instrument at frequencies adjacent to the carrier frequency. This can be achieved by the selection of FM ON and a setting of '0' deviation. A useful alternative method for controlling the FM deviation setting if required is to use the

key to reduce the value to zero and the

key to return to a previous setting.

Setting a.m.

12. The procedure for selecting a value of a.m. depth is similar to that described for setting f.m., the only differences being that the AM function key is pressed and the instruction data is ended by the terminating key

Setting r.f. level

13. Press the RF LEVEL key and enter the required data including any decimal point or minus sign as required. The terminator keys give a choice of volts, millivolts, microvolts or decibels. Linear voltage scales can be calibrated in either e.m.f. or p.d. and are set up by a second function control. Further references for the logarithmic dB scales are also set up by the second function control, for details see Second function operations.

Reverse power protection

14. The instrument is protected from accidental application of reverse power, if the reverse power protection (RPP) unit is tripped the integral RF LEVEL l.e.d. will flash and the REV PWR LIMIT annunciator will be set on the RF LEVEL display. During this time the keyboard will not respond except to reset commands. After the source of power has been disconnected the RPP is reset by pressing the RF LEVEL function key. When the instrument is switched OFF, the output socket is automatically disconnected from the output attenuator - a further safety feature.

Store and recall

15. The instrument has 50 non-volatile stores available. Stores numbered 10 - 19 store complete instrument settings (excepting increment values). Stores 20 - 59 store settings of carrier frequency only.

(1) To store press STORE followed by a numeral entry.

(2) To recall, press RECALL and the appropriate numerals.

16. To store a set of modulation and r.f. levels that can be applied to any carrier frequency first enter a carrier frequency of 0 Hz followed by the required modulation and r.f. level values. Press the STORE key followed by one of the instrument stores 10 to 19 to retain the settings. Subsequently recalling the store with the RECALL key will retrieve the modulation and r.f. level leaving the current setting of carrier frequency selected. This is a useful method of transferring a standard set of modulation/level settings onto carrier frequencies entered by the operator.

SECOND FUNCTION OPERATIONS

17. Second function operations provide a means of controlling various secondary features and calibrations within the instrument. Access to many of these operations is generally not required during routine use of the instrument and some should only be accessed by skilled personnel during the course of realignment, fault finding, or repair. There are three levels of operation as follows.

(1) Normal operation (second functions 0, 1, 2 and 3 are unprotected and can be accessed directly).

(2) First level operation (second functions 4, 5 and 6 have a first degree protection. Access to this level can be gained after operating an unlocking procedure described in para. 19).

(3) Second level operation (second functions 7, 8, 9 and '.' (decimal point) have a second degree protection and can only be accessed by the operation of a special key code). Details of the code are given in the Service Manual.

18. In general the second function mode is entered by pressing the blue

key followed by a number between 0 and 9 corresponding to the second function required. Pressing the second function key inhibits the action of some keys, however the instrument can always be restored to its normal operating mode by pressing any of the orange function keys. This means of exit from second function operation is always safe, i.e. it will not corrupt any data, or alter any status bits and the displays will revert to their normal functions. No data will be permanently altered unless the

key is pressed. The operation of each of the secondary functions is as follows:-

Second function '0' UNLOCK

19. Switching on the instrument, automatically sets all second functions 4 - 9 to the Locked mode. This allows direct access to second functions 1, 2 or 3 only. Access to second functions 4, 5 or 6 may be obtained by overcoming the first level of protection. Unlocking is achieved by pressing the SECOND FUNCT and '0' keys followed by the MOD OSC and ON/OFF keys, both of which must be pressed simultaneously for a minimum of 5 seconds.

20. The instrument will then be unlocked at the first level allowing the selection of second function modes 4, 5 or 6 as required. If the sequence is in error, or aborted part way through, the instrument will remain locked. Once unlocked the instrument remains so until either the SECOND FUNCT and '0' keys are once more pressed or until the instrument power is switched off.

Notes...

(1) Access to all second functions is always available over the GPIB (where fitted). Care must therefore be taken when selection of either First or Second level operations are required. Access to second functions via GPIB selection should be restricted to personnel who have a full knowledge of these operations and require access to them in the course of realignment, fault finding or repair only. If inadvertent selections are made it is possible to invalidate the instrument's calibration.

(2) The instrument always reverts to the locked state after using the bus.

Second function 1 'Status'

21. Entering

will result in the instrument displaying status information as shown below in Fig. 4.

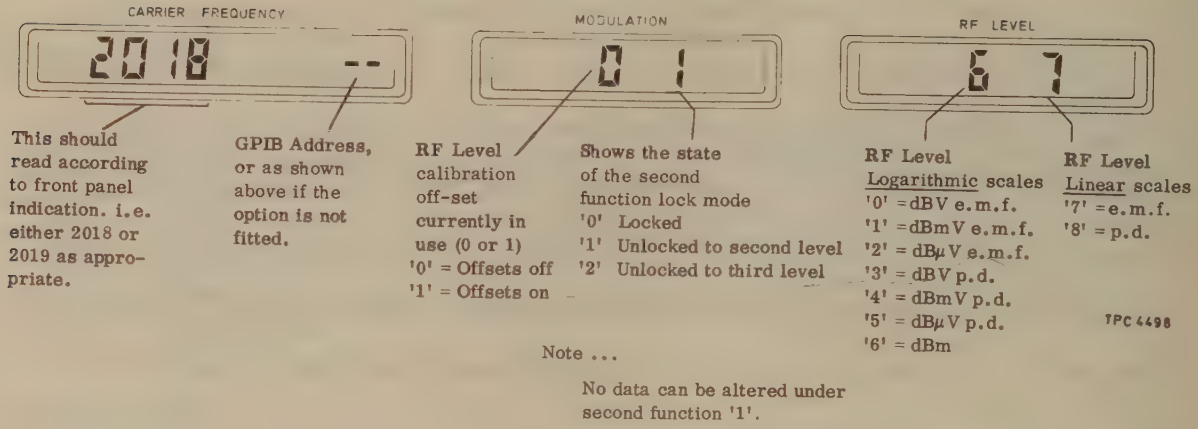

CARRIER FREQUENCY
2018 --
MODULATION
0 1
RF LEVEL
6 7
This should read according to front panel indication. i.e. either 2018 or 2019 as appropriate.
GPIB Address, or as shown above if the option is not fitted.
RF Level calibration off-set currently in use (0 or 1)
'0' = Offsets off
'1' = Offsets on
Shows the state of the second function lock mode
'0' Locked
'1' Unlocked to second level
'2' Unlocked to third level
RF Level Logarithmic scales
'0' = dBV e.m.f.
'1' = dBmV e.m.f.
'2' = dBμV e.m.f.
'3' = dBV p.d.
'4' = dBmV p.d.
'5' = dBμV p.d.
'6' = dBm
RF Level Linear scales
'7' = e.m.f.
'8' = p.d.
TPC 4498
Note ...
No data can be altered under second function '1'.

Fig. 4 2018 second function '1' status mode

Second function 2 'GPIB address setting'

22. If the GPIB option is not fitted the sign "--" is displayed in the carrier frequency display; otherwise the current GPIB address is displayed. If a new address is required, this may be entered via the keyboard. Numbers rotate in from the right. When the required address is displayed pressing

key will, if the address is acceptable (00 - 31), replace the previous one. If the address is too large it will be ignored and the current address re-displayed instead.

Second function 3 'Manual latch setting'

23. This function allows you to direct an 8 bit binary instruction to any of the instrument's internal latches for testing and fault finding. This facility is fully described in the Service manual and is an invaluable aid when diagnosing internal instrument bus or latch faults. On exiting from second function 3 all latch data which may have been over-written is restored, except latches with data valid line 4 (controls the GPIB interface), and latch L7A10 (pulse modulator control).

Second function 4 'SRQ mask setting'

24. Select SECOND FUNCT mode and complete the unlocking procedure given in para. 19, followed by the numeral 4. The SRQ mask allows you to instruct the instrument not to request service over the GPIB for particular conditions. An 8 bit binary number is displayed in the frequency display window. In each position a '1' indicates that the mask is set, i.e. no SRQ command will result from an occurrence of the condition to which the bit refers. 1's or 0's entered from the keyboard are rotated in from the right. When the bit '1' is in the required position press the

key. For more information on the significance of each digit see the para. 47 - Error numbers. Fig. 5 below shows the mask set to ignore a GPIB bus error (Error No. 5).

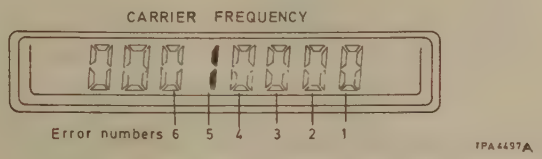


Fig. 5 SRQ mask setting display

Second function 5 'RF level units setting'

25. Select SECOND FUNCT mode and complete the unlocking procedure given in para. 19, followed by the numeral 5. On entering second function 5 two digits are displayed in the r.f. level display. These represent the two scales of r.f. level units which are currently selected, the left-hand digit represents the logarithmic scales and the right-hand digit the linear scales as shown below:-

Left digit (logarithmic scale)	*Right digit (linear scale)*
0. dBV e.m.f. 3 dBV p.d.	7. e.m.f.
1. dBmV e.m.f. 4 dBmV p.d.	8. p.d.
2. dBµV e.m.f. 5 dBµV p.d.	
6. dBm	

These units may be selected via the keyboard by entering the numbers corresponding to the units required and then pressing the

key.

Second function 6 'RF level offsets'

26. First select a carrier frequency within the chosen band followed by a suitable r.f. level. Then select 2nd FUNCT mode key and complete the unlocking procedure given in para. 20, follow this by pressing the numeral 6 key. In addition to the standard calibration for r.f. output level, the instrument has a capability for overall level adjustment to facilitate matching with other equipment. The output level can be raised or lowered by approximately 2 dB in the offset mode.

Selection on or off is made with the above keys, '1' selecting offset on, or '0' offset off. Indication of the selected state is displayed in the modulation display window with either a '1' or '0' as appropriate.

Reselect the numeral '1' followed by either the ⇧ (UP) or the ⇩ (DOWN) key to increment the r.f. level by 0.1 dB. Each successive 'UP' or 'DOWN' selection will then increment the r.f. by a further 0.1 dB. When sufficient offset has been determined press the 'STORE' key to finalize the selection which will, together with the offsets on selection, remain valid until further adjustment is made. If an offset value of 0.1 dB is selected when the instrument is set to the limit of its operating range i.e. +13 dBm or equivalent, a limit annunciator will be set and a maximum r.f. level of+12.9 dBm will be displayed (a further +0.1 dB offset increment will decrease this to +12.8 dBm).

Second function '-' (minus sign). Recall 'STORE 10' at switch on

27. This facility allows the instrument to be operated in a remote or unattended location with a pre-selected set of conditions which will remain unchanged in the event of inadvertent switching off and on of the input supply voltage. In the normal operating mode if this happens, the instrument would resume the initial operating mode, that is CARRIER FREQ 520 MHz (2019, 1040 MHz), internal MOD OSC 1 kHz, no FM or AM MODULATION and minimum RF LEVEL (-127 dBm or equivalent). These conditions can be superseded by storing the required operating conditions into 'STORE 10' and carrying out an automatic recall of the 'STORE 10' settings using the Second function '-' mode. The facility is available on all instruments whose software program mod. state is 07 or greater.

(1) First select by means of the front panel keyboard, the required CARRIER FREQ. MODULATION and RF LEVEL settings.

(2) Press the 'STORE' key followed by the numerals '10'.

(3) Select SECOND FUNCT mode and complete the unlocking procedure given in para. 19, follow this by pressing the '-' key. Finally press the 'STORE' key again.

If the supply voltage is interrupted, then restored, the instrument will first reset to the initial operating mode then automatically carry out a 'RECALL 10' instruction and reset to the 'STORE 10' conditions previously set. To disable the facility first unlock the instrument to First level operation, select 'SECOND FUNCT' '-' followed by the numeral '0', and finally the 'STORE' key.

Second functions 7, 8, 9 and '•' (decimal point)

28. The following facilities all have second degree protection, further information on these facilities and details of the special key code are contained in the Service manual.

Second function 7 : RF level calibration
Second function 8 : FM tracking
Second function 9 : 2018/2019 Software flag
Second function '•': Calculation and storage of amended EAROM check sum

OPERATION WITH 75 Ω LOADS

29. The performance specification for the instrument assumes operation into 50 Ω external loads, but often it is desirable to work into mismatched loads. This is in general possible although an uncertainty of performance may be introduced. When external loads of 75 Ω are employed these can be accurately matched for carrier frequencies up to 500 MHz by using a 50/75 Ω Impedance Adaptor Code no. 54411-051X offered as an optional accessory.

30. This 25 Ω series load maintains the correct open circuit voltage calibration and allows the reverse power protection circuit to function correctly.

GENERAL PURPOSE INTERFACE BUS (GPIB) FUNCTIONS

31. The GPIB interface, offered as an optional accessory allows the instrument to be coupled to a controller. The essential purpose of the GPIB functions are described below. Further information on the general features and applications of the GPIB system can be obtained from the separate GPIB manual offered as an optional accessory.

32. 2018/2019 have both talker and listener capabilities. One address is used for both talking and listening and is set via the front panel or via the GPIB using Second function 2. The instrument can request service (assert SRQ) on certain error conditions under the control of an SRQ mask which is set using Second function 4.

SH1 : Source handshake (complete capability)

33. The source handshake sequences the transmission of each data byte from the instrument over the bus data lines. The sequence is initiated when the function becomes active, and the purpose of the function is to synchronize the rate at which bytes become available to the rate at which accepting devices on the bus can receive the data.

AH1 : Acceptor handshake (complete capability)

34. The acceptor handshake sequences the reading of the data byte from the bus data lines.

T6 : Talker function (no talk only function)

35. The talker function provides the 2018 with the ability to send device dependent messages over the bus to other devices. The ability of any device to talk exists only when it has been addressed as a talker.

L4 : Listener function (no listen only function)

36. The listener function provides a device with the ability to receive device dependent messages over the bus. The capability only exists where the device is addressed to listen via the bus by the controller.

SR1 : Service request function (complete capability)

37. The service request function gives the 2018 the capability to inform the controller when it requires attention.

RL1 : Remote/local function (complete capability)

38. The remote/local function allows the 2018 to be controlled either by the local front panel keys or by device dependent messages over the bus.

DC1 : Device clear function (complete capability)

39. Device clear is a general reset and may be given to all devices in the system simultaneously (DCL) or only to addressed devices (SDC). 2018 resets to the status mode, that is

Maximum carrier frequency (2018 - 520 MHz) (2019 - 1040 MHz)
No a.m., f.m., or pulse modulation
Minimum r.f. level - 127 dBm or equivalent
Modulation oscillator frequency 1 kHz
Internal modulation selected.

Before these conditions are set, an EAROM check sum is calculated for the calibration data (FM tracking and RF level) and referred to a number held in the non-volatile memory. If this test of calibration validity fails, the instrument responds by asserting SRQ. The status byte will contain the number 6 to signal a calibration data fault in addition to the 'SRQ asserted' bit. In order to continue with the device clear (and normal operation thereafter) the instrument must be restarted by sending any valid instruction code (e.g. "CF"). This serves only as a reset and will not be interpreted in the normal way.

E1 : Open collector drivers

40. The GPIB drivers fitted to 2018 have open collector, rather than tristate, outputs.

Listening function

41. The 2018 is remotely controlled over the GPIB by strings of two-character codes and digits sent in upper case ASCII format. Where possible these codes correspond directly to the front panel keys : however where the normal front panel control requires a knowledge of the previous state of the instrument (e.g. toggling controls such as on/off), special codes are provided to simplify programming.

42. In order to improve the readability of control strings, the codes may be separated by commas. These are ignored by the instrument. When data is entered, the syntax is the same over the GPIB as that used in control from the front panel. For example to enter a complex string of instructions such as a carrier frequency of 123.45 MHz with an increment of 25 kHz and an r.f. level of 1.2 µV the string can be sent as follows, "CF 123.45 MZ, DE CF 25 KZ, LV 1.2 UV". Or similarly, if it required to change the r.f. level units setting to dBm (Second function mode 5, logarithmic scale 6), the string "SF 5, 6, ST" should be sent.

43. The ON/OFF and INT/EXT controls operate on the function currently active for data entry. This may be specified, e.g. "FM ON"; "AM XT" or implied, e.g. "FM 1.5 KZ, IT" but it is recommended that the function is specified within the string to ensure that the string will always have the same result.

GPIB programming codes

44.

Functions

DE	Delta (Increment/Decrement)
CF	Carrier frequency
FM	Frequency modulation
AM	Amplitude modulation
PU	Pulse modulation (If option is fitted)
LV	RF level
SF	Second function (see Chap.3, p.9, para.20 Notes)
RS	Reset RPP

Miscellaneous functions

All numerals correspond to the front panel keys

IT	Internal	
XT	External	
ST	Store	followed by a number 10 - 59
RC	Recall	
RT	Return	
UP	Up	
DN	Down	
ON	On	
OF	Off	

Units

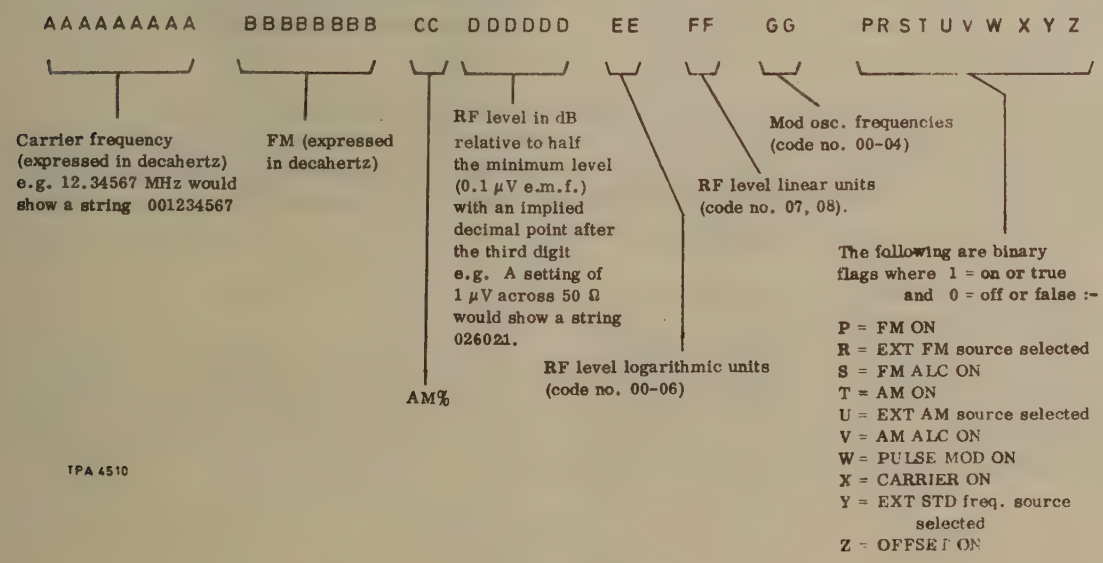
MZ	Megahertz	VL	Volt
KZ	Kilohertz	MV	Millivolt
HZ	Hertz	UV	Microvolt
PC	Percentage	DB	Decibel

Mod OSC/ALC

MØ	Mod osc. freq. 300 Hz	AØ	ALC off
M1	" " " 400 Hz	A1	ALC on
M2	" " " 1 kHz		
M3	" " " 3 kHz		
M4	" " " 6 kHz		

Talking function

45. When addressed to talk, the 2018 has two possible responses. If the instrument is in the Second function mode it will talk a four digit string which represents the display shown in the r.f. level window. This is intended to be used in the setting of the f.m. tracking table and the level calibration numbers. If the display shows "---" to indicate that the instrument is off tune, or otherwise unsuitably set to adjust the f.m. tracking, the GPIB controller will read the string ">>>" and 2018 will request service. In all other modes of operation, 2018 will talk a 41 character string of decimal numbers of the form shown below.


AAAAAAAA
BBBBBBBB
CC
DDDDDD
EE
FF
GG
PRSTUVWXYZ
Carrier frequency (expressed in decahertz) e.g. 12.34567 MHz would show a string 001234567
FM (expressed in decahertz)
AM%
RF level in dB relative to half the minimum level (0.1 µV e.m.f.) with an implied decimal point after the third digit e.g. A setting of 1 µV across 50 Ω would show a string 026021.
RF level logarithmic units (code no. 00-06)
RF level linear units (code no. 07, 08).
Mod osc. frequencies (code no. 00-04)
The following are binary flags where 1 = on or true and 0 = off or false :-
P = FM ON
R = EXT FM source selected
S = FM ALC ON
T = AM ON
U = EXT AM source selected
V = AM ALC ON
W = PULSE MOD ON
X = CARRIER ON
Y = EXT STD freq. source selected
Z = OFFSET ON
TPA 4510

Service requests (SRQ)

46. The 2018 can request service to warn the controller of certain error conditions. In response to a serial poll after asserting the SRQ line, the 2018 will provide a status word (8-bits) in which bit 6 is set to indicate an SRQ request and the first five bits Ø to 4 indicate an error number. The

error number is also displayed briefly in the carrier frequency window. During this time the 2018 will not handshake any new information over the bus: after the delay the response will continue as normal whether the SRQ has been serviced or not (except error No. 6 which requires a restart command).

Error numbers

47.

No.	*Error condition*	*Action taken*
1	Reverse power protection system tripped.	Output isolated.
2	Attempt to store f.m. tracking number greater than 255.	Old tracking number restored
3	Unrecognized character pair received.	Ignore both characters: e.g. if the string "Q, CF, MO" was received, the "Q, C" would produce error 3, and the remainder of the string would be interpreted as "FM, O".
4	Option not fitted.	None.
5	GPIB bus error.	None.
6	Calibration data check sum error	Wait for restart instruction (any function code or digit).

SRQ mask

48. The SRQ response to the errors listed above can be suppressed by setting an 8-bit mask, via Second function 4. The bits of the mask refer directly to the errors, i.e. the right most bit set indicates no response to error 1, the second from right no response to error 2, etc.

49. The mask is displayed by selection of Second function 4, and may be changed by entering '1's and '0's via the keyboard. The store key is pressed to finalize a change. The SRQ mask is not stored, either in the instrument setting stores or when power is removed: when the instrument is initially switched on the mask is set to all '0's.

Reverse power protection

50. When tripped by an overload applied to the RF OUTPUT socket, the GPIB SRQ line is asserted, and the status byte (obtainable by the controller conducting a serial poll) will contain the value 65 (decimal). The RPP can be reset by the bus by sending the RS command.

Clear, switch on, and return to local

51. SDC and DCL clear 2018 to the following state:-

Max. carrier freq. 520 MHz (2019 - 1040 MHz).
Min. output level, -127 dBm or the equivalent.
Carrier on.
FM, a.m., pulse modulation, off.
Internal modulation selected.

To revert from GPIB to front panel control, press the 'RETURN' key.

If a Local lock out command has been given the return key operation will be ignored.

Notes...

(1) Int/Ext frequency standard selection and instrument stores are unaffected by the SDC and DCL commands.

(2) Switching on clears the 2018 to the same state as SDC or DCL unless Recall 'STORE 10' at switch on, conditions apply.

GPIB connector contact assignments

52. The contact assignment of the GPIB cable connector and the device connector is as shown in Fig. 6 below.

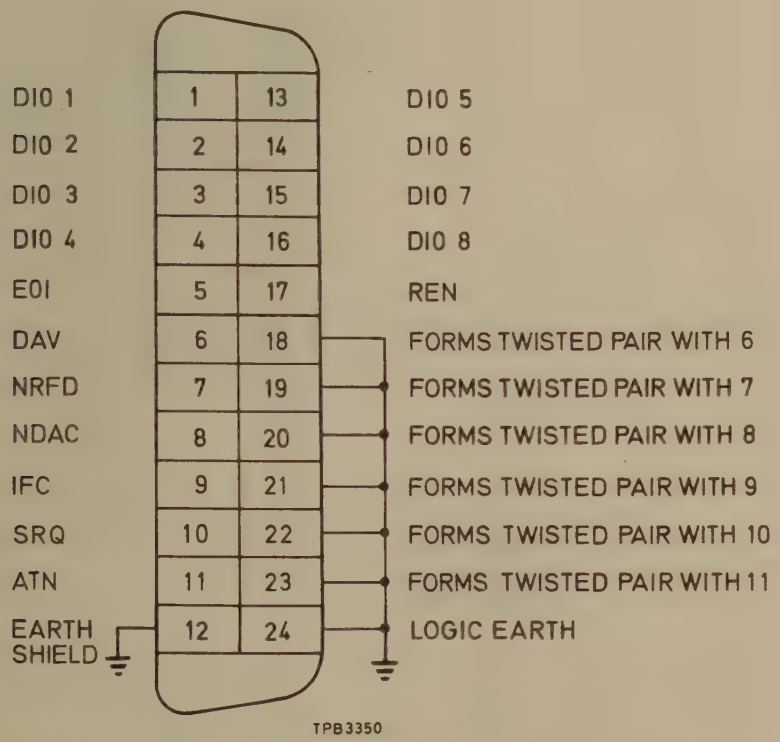


Fig. 6 GPIB connector contact assignments

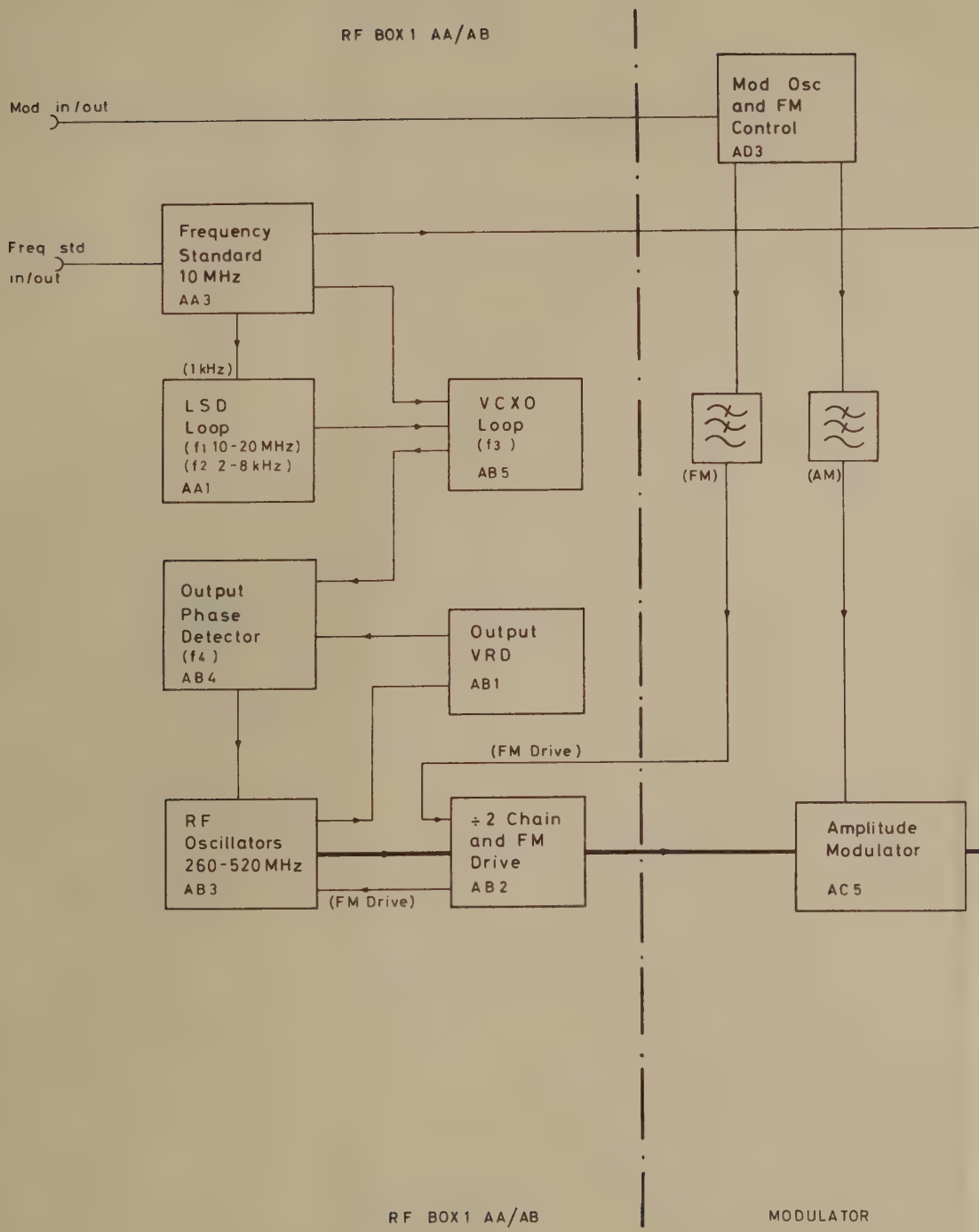
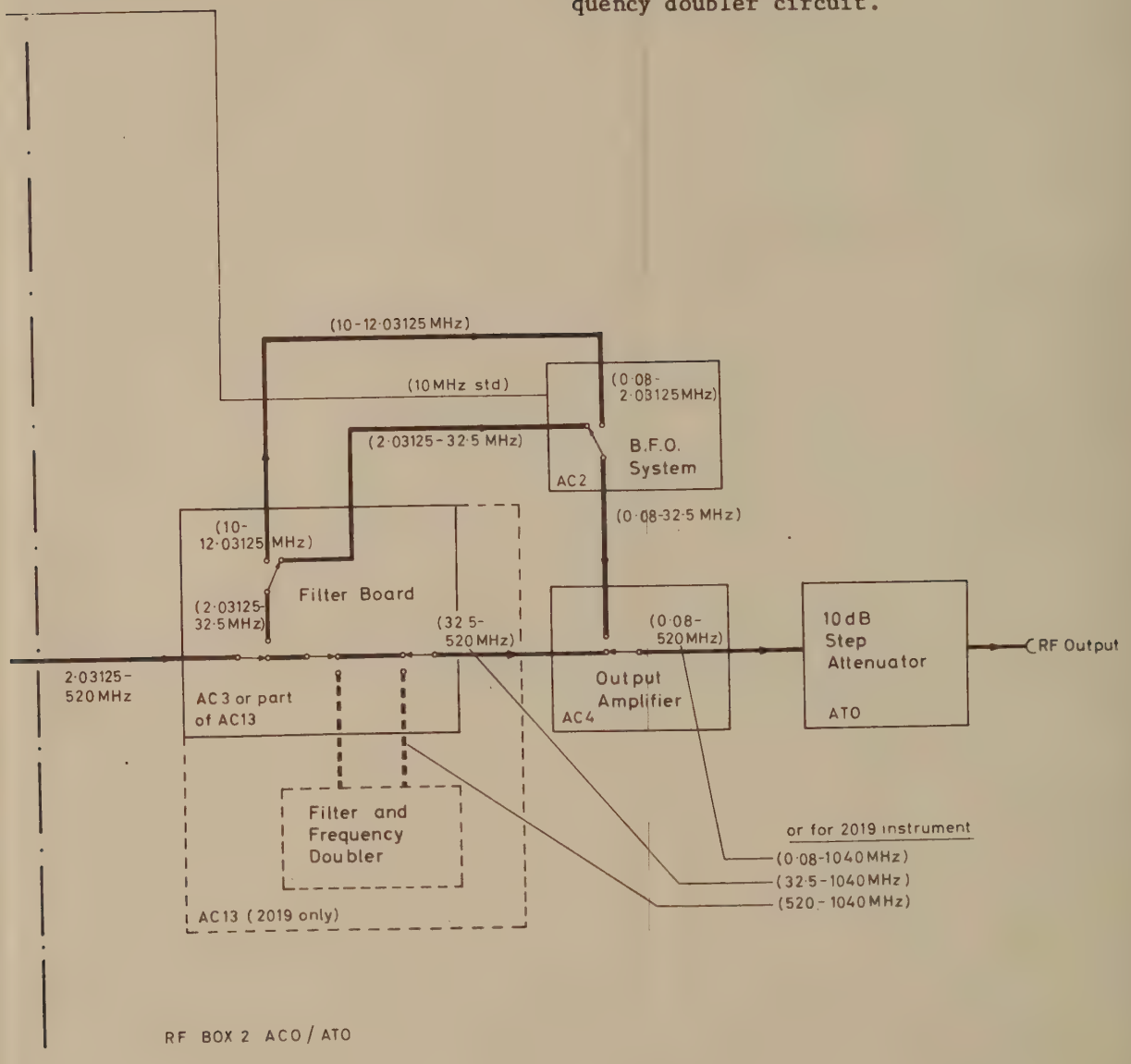

RF BOX 1 AA/AB
Mod in/out
Mod Osc and FM Control AD3
Freq std in/out
Frequency Standard 10 MHz AA3
(1 kHz)
LSD Loop (f1 10-20 MHz) (f2 2-8 kHz) AA1
VCXO Loop (f3) AB5
(FM)
(AM)
Output Phase Detector (f4) AB4
Output VRD AB1
(FM Drive)
RF Oscillators 260-520 MHz AB3
÷2 Chain and FM Drive AB2
(FM Drive)
Amplitude Modulator AC5
RF BOX 1 AA/AB
MODULATOR

Fig. 7 2018/2

Note

2018 comprises basic instrument with board AC3 fitted.
2019 includes board AC13 in lieu of AC3, this board provides AC3 functions and an additional frequency doubler circuit.



TPD4494

019 simplified block diagram

2018 & 2019

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